AMENDMENT TO THE SPECIFICATION:

Please amend the second paragraph on page 1 as follows:

GMSK (Gaussian minimum shift keying) or GFSK (Gaussian frequency shift keying) modulation are widely adopted approaches by many wireless communication standards such as GSM (Global System for Mobile communications), DECT (Digital European Cordless Communications) and Bluetooth. There are several demodulation structures for GFSK including coherent demodulation and differential demodulation. Carrier recovery for coherent demodulation increases the carrier acquisition time to a relatively high degree. Therefore, for a burst-mode communication system, differential demodulation is often preferred. In a radio communication system due to either discrepancy between the oscillators at the transmitter and the receiver, or the Doppler effect, frequency offset between the transmitter and receiver usually occurs, which degrades the performance of the system. In order to ensure a satisfactory BER (bit error rate) performance, it is important to compensate for the effect of frequency offset. This is particularly true for the case of burst mode communication systems where a fast and robust method to estimate and eliminate the effect of frequency offset is deemed necessary.

AMENDMENT TO THE CLAIMS:

Please amend claims 1-2 and 4-8, 10-16 and 18-19 as follows:

1. (Currently Amended) A differential detector comprising:

a frequency converter arranged to convert an input signal into a demodulated baseband signal;

~~sampling means~~ a sampler stage arranged to sample said demodulated baseband signal at a sampling frequency to provide a sampled signal;

a demodulator arranged to demodulate the sampled signal to provide a demodulated signal; and

a frequency offset sensor ~~sensing means~~ arranged to sense an envelope of the demodulated signal to provide an offset signal indicative of a frequency offset of the input signal.

2. (Currently Amended) A differential detector according to claim 1, wherein said ~~sensing means~~ frequency offset sensor comprises:

~~means arranged to track~~ a tracker arranged to track the envelope of said demodulated signal from said demodulator and provide a tracking signal; and

a filter arranged to low pass filter the tracking signal to provide the offset signal.

3. (Original) A differential detector according to claim 2, wherein said filter is an adaptive IIR filter.

4. (Currently Amended) A differential detector according to claim 2, wherein said ~~sensing means~~ frequency offset sensor further comprises a filter coefficient generator.

5. (Currently Amended) A differential detector according to claim 4, wherein said filter coefficient generator

~~reduces~~ is arranged to reduce the filter coefficient as a function of time.

6. (Currently Amended) A differential detector according to claim 5, wherein said filter coefficient generator ~~adjusts~~ is arranged to adjust the coefficient of filter according to the following:

$$\alpha_n = \frac{31}{32}\alpha_{n-1} + \frac{1}{32} * \frac{1}{256},$$

wherein α_n is the filter coefficient at time n, α_{n-1} is the filter coefficient at time n-1.

7. (Currently Amended) A differential detector as claimed in claim 2 wherein said filter ~~has~~ is arranged to have a bandwidth which decreases as a function of time.

8. (Currently Amended) A differential detector according to claim 1 wherein said ~~sensing means~~ frequency offset sensor further comprises a reset signal generator arranged to detect the start of input data transmission and reset the ~~sensing means~~ frequency offset sensor.

9. (Original) A differential detector as claimed in claim 8 wherein the generator is arranged to detect signal power to detect the start of transmission.

10. (Currently Amended) A differential detector as claimed in claim 9 wherein the demodulator comprises ~~power normalizing means~~ a normalizer arranged to generate a power signal from the sampled signal and provide a normalized demodulated signal to the generator.

11. (Currently Amended) A differential detector as claimed in claim 1 wherein the demodulator includes ~~power normalizing means~~ a normalizer arranged to generate a power signal from the sampled signal and provide a normalized demodulated signal to the ~~sensing means~~ frequency offset sensor.

12. (Currently Amended) A differential detector according to claim 1, wherein the ~~sensing means~~ frequency offset sensor further comprises a comparator arranged to compare said demodulated signal with a threshold provided by the offset signal to provide an output signal.

13. (Currently Amended) A differential detector according to claim 12, ~~wherein~~ arranged for said comparator ~~provides~~ to provide a logical "1" output if said demodulated signal is larger than the threshold and otherwise ~~output~~ provide a logical "0" output.

14. (Currently Amended) Apparatus as claimed in claim 1, wherein the ~~sensing means~~ frequency offset sensor is arranged to sense the envelope of the demodulated signal by making the following determinations:

if $x_n < x_{n-1} > x_{n-2}$ and $x_{n-1} > Min + threshold$ and $x_{n-1} < MAX$,

And if $x_{n-1} > Max$ or $x_{n-1} > dc_{n-1}$, then $Max = x_{n-1}$

if $x_n > x_{n-1} < x_{n-2}$ and $x_{n-1} < Max - threshold$ and $x_{n-1} > -MAX$,

And if $x_{n-1} < Min$ or $x_{n-1} < dc_{n-1}$, then $Min = x_{n-1}$

where, χ_n, χ_{n-1}, χ_{n-2} are respectively a sample at time n, a sample at time n-1 and a sample at time n-2 of said first input signal, dc_{n-1} is a low frequency component of the envelope of the demodulated signal at time n-1, Max and Min represent values of negative and positive peaks of the envelope of the demodulated signal, and threshold and MAX are preset constants.

15. (Currently Amended) Apparatus as claimed in claim 14, ~~wherein~~ arranged for the threshold and MAX ~~are~~ to be proportional to a sampling duration, a modulation index or amplitude of the demodulated signal.

16. (Currently Amended) Apparatus as claimed in claim 2, wherein the ~~sensing means~~ frequency offset sensor is arranged to sense the envelope of the demodulated signal by making the following determinations:

if $x_n < x_{n-1} > x_{n-2}$ and $x_{n-1} > Min + threshold$ and $x_{n-1} < MAX$,

And if $x_{n-1} > Max$ or $x_{n-1} > dc_{n-1}$, then $Max = x_{n-1}$

if $x_n > x_{n-1} < x_{n-2}$ and $x_{n-1} < Max - threshold$ and $x_{n-1} > -MAX$,

And if $x_{n-1} < Min$ or $x_{n-1} < dc_{n-1}$, then $Min = x_{n-1}$

where, χ_n, χ_{n-1}, χ_{n-2} are respectively a sample at time n, a sample at time n-1 and a sample at time n-2 of said first input signal, dc_n-1 is a low frequency component of the envelope of the demodulated signal at time n-1, Max and Min represent values of negative and positive peaks of the envelope of the demodulated signal, and threshold and MAX are preset constants.

17. (Original) Apparatus as claimed in claim 16, wherein said filter is arranged to calculate a component of the offset signal of the form:

$$dc_n = (1-\alpha_n)dc_{n-1} + \frac{\alpha_n}{2}(Max + Min)$$

where, dc_n is said frequency component of said input signal at time n, dc_{n-1} is said frequency component at time n-1, and α_n is a coefficient of the filter at time n.

18. (Currently Amended) A detector as claimed in claim 1 wherein the demodulated ~~baseboard~~ baseband signal and the sampled signal comprise two signal components in phase quadrature.

19. (Currently Amended) A differential detector comprising:

a frequency converter arranged to convert an input signal into a demodulated baseband signal;

~~sampling means~~ a sampler stage arranged to sample said demodulated baseband signal at a sampling frequency to provide a sampled signal;

a demodulator arranged to demodulate the sampled signal to provide a demodulated signal; and

a filter arranged to filter the demodulated signal to provide a filtered signal indicative of a frequency offset of the input signal and wherein the filter is arranged to have a bandwidth which decreases as a function of time.